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XXXII. *An Account of the Effects of Lightning on a House, which was furnished with a pointed Conductor, at Tenterden, in Kent. In Two Letters from Richard Haffenden, Esquire, the Proprietor of the House, to Mr. Henley. To which are added some Remarks by Mr. Henley.*

Redde, May 4,
1775.

HAVING been informed by my friend Mr. CURTEIS, that the house of RICHARD HAFFENDEN, esquire, at Tenterden, in Kent, had been damaged by a stroke of lightning, notwithstanding it had been furnished with a metallic conductor to prevent those accidents: I wrote to Mr. HAFFENDEN, requesting the favour of the particulars, and especially an answer to the following questions.

1. The length and breadth of the house?
2. The height of the chimney, to which the conductor was affixed from the ground, and how far it might rise above the ridge or roof of the house?
3. To what height the conductor was carried up above the top of the chimney?
4. Whether it was terminated by a sharp point, a blunt end, or a ball?
5. Whether it was in regular contact from the top to the bottom?
6. What was its diameter or breadth?
7. Was it carried down into the moist earth, or water?
8. What is the nature of the soil it enered?
9. Did any other chimney, or stack of chimnies,

chimnies, sustain a stroke, besides that which carried the conductor; and what was the distance of each of the stricken chimnies from the conductor? and was there any communication of lead on the ridge or roof of the house, that might connect such chimney, or part of the house in which a stroke was received, with the conductor? 10. What was the damage the house sustained; and how was the electricity conveyed to the earth? 11. Doth your house stand single? 12. Is it situated on a plain, or on an eminence? 13. Had it rained before the stroke; and was that part of the house on which the lightning fell, considerably wetted at the time? 14. Did the wind blow toward that part of the house? 15. When did the accident happen?

L E T T E R I.

SIR,

I RECEIVED yours of the 31st ult.; in answer to which, please to observe the following sketch of the top of the house (*vide* TAB. VII. fig. B.). *a, b, c, d*, are four chimnies, about thirty-eight feet high, and two feet above the ridge of the house. *f* is the conductor, elevated about five feet above the top of the chimney: it is made of iron, about half an inch diameter, tapering to a point, gilt. After being fixed to the chimney, eight or ten feet, it turns under the roof to the leaden pipe (*g*), which carries the water from the gutters *E, E, E*, and goes down on the outside of the house, till it reaches within four feet of the

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earth.

earth. In the lower end of this pipe is put one end of a square rod of iron, about three quarters of an inch in breadth; the other end of the iron-rod rests on the ground, at the distance of six feet from the foundation. The soil is light mould. The house stands single, on the West side of a hill; the front toward the hill. On the top of the hill, at about forty rods distance, is a wind-mill, whose bottom is nearly as high as the top of the house. About two of the clock in the morning of June 17, 1774, after thundering for six or seven hours at a distance, and coming slowly on, there being little or no wind, there came three amazing strokes. It rained extremely at the time; but ceased immediately at the last stroke, which struck the top of the chimney (*b*) the furthest from the conductor, and broke it down to the lead (*b*), where it divided; some up and down the rafters (*i, i,*) breaking and splitting both tiles and rafters into thousands of pieces, and throwing some of them to a great distance, till it reached the gutter (*E*), which was full of water. Another part, or division of the explosion, broke the mortar down to the lead on the cornice (*k, k, k,*); which lead goes round the front of the house. Through this lead the lightning passed quietly, till it reached the chimney (*c*), and broke the mortar on that chimney, till it reached the lead adjoining to it; through which lead it passed quietly, and then broke the tiles to the lead on the chimney (*d*); and from thence it passed to the gutter or leaden pipe; and there, uniting with the other division of the explosion, it passed down the leaden pipe

pipe to the iron bar at the bottom; where, by an explosion, it burst a hole in the pipe, in passing from one metal to the other; and then went down the iron rod to the ground, flowing with water. It seems to me, according to the situation and direction of the cloud, being nearer to the gutters than the conductor, that *they acted as conductors*; and that the conductor itself was not in the least affected by the stroke; and that had there been conductors on the chimnies (*a* and *b*) they would have conveyed the electric fluid to the ground, without any damage to the house: or had there not been a continuation of metal from the gutters, &c. to the earth, it would have damaged the house all the way down. There was another division of the explosion, which, I imagine, came down the chimney, and struck to a bell-wire in the passage, and destroyed the wire to its end, which happened to be just within-side the wall, where the water-pipe was without; and there it made a small hole, in the joint of the bricks of an eighteen-inch wall, to the pipe; and then passed to the earth with the rest. I think this accident is no proof whatever of the preference of balls or points as terminations of conductors. Thus, SIR, I have endeavoured to answer every one of your queries; which, if satisfactory, will give pleasure to, &c.

N. B. The pricked line in the figure shews where the lightning passed quietly, having a sufficient substance of metal to pass through. The *curved line* shews where it broke every thing. The diagonal lines are all lead.

LETTER

L E T T E R II.

SIR,

I HAVE received your two last; and can assure you, it is with great pleasure I answer any question you shall be pleased to ask. In answer to your first and second queries; *videlicet*, What is the breadth of the house? and what is the distance between the extreme part of the chimney (*b*) and the conductor? The drawing I sent you is a scale of one-tenth of an inch to a foot, or nearly so^(a). 3d. The iron rod in the pipe is only a large *rusty spit* put in, a few inches, *pro tempore*. The place where the leaden pipe is bursten, is even with the point of the spit; very little melted, but broke open with the explosion. The pipe is bent outward, about a foot at the lower end, to carry the water from the house; the hole in which, and the point of the spit, are near the middle of that projecting part of the pipe. No visible alteration appeared on the rusty spit by the lightning having passed through it. The lower end of it lays *on*, not *in* the earth. I am, &c.

(a) Then, the breadth of the house is about twenty-nine feet, and the distance between the farthest corner of the chimney (*b*) and the conductor, about forty-nine or fifty feet. W. HENLEY.

THESE

THESE letters containing a satisfactory answer to the questions which precede them, the following remarks naturally present themselves. 1st, A sharp pointed conductor did not, in this instance, invite or draw down upon itself a stroke of lightning. 2dly, Such a conductor, elevated five feet above the top of one of the chimnies, to an house of this dimension, may not perhaps be sufficient, by its silent attractive force, to protect the whole of such a building from a stroke; especially when a chimney, *a blunt body*, wetted with the rain, standing at fifty feet distance from the conductor, and being within five feet of its height, is in actual contact with so large, though irregular, a communication of metal, leading from the chimney directly to the conductor; though, in this instance, it should be remarked, that the conductor itself *was not in contact* throughout; and it is, for that reason, a very exceptionable case. 3dly, Two such conductors; one, for instance, on the chimney (*d*), where this was placed; and the other, on the chimney (*b*), which was stricken, with a communication of lead between them, would probably have protected the house: but a conductor on each chimney would certainly have secured the whole building effectually (*b*). 4thly, As the three branches or divisions of the lightning all concentrated upon an iron bar, *three quarters of an inch square*, and produced no sign of heat in it, an iron bar of that size seems to be fully sufficient for the purpose. There ap-

(*b*) This method, I am informed, Mr. HAFENDEN hath lately adopted.

pears, however, to have been two defects in Mr. HAF-FENDEN's conductor: 1. The leaden pipe and the iron bar at the bottom were not in contact. 2. The iron bar, or a thick plate of lead, should have been continued down into the moist earth or water; and had not the earth, as Mr. HAFFENDEN observes, flowed with water, at the time of the accident, the want of this precaution might, perhaps, have been attended with some damage to the foundation. I have been thus particular in my inquiries into, and remarks upon, this fact, as I think it of great importance to those who erect conductors, to be informed of every defect in the construction, and of the dangerous consequences thence arising.

P. S. In Mr. HAFFENDEN's second letter, he observes, that the bell-wire, mentioned in his first letter, was brass; and that so much of it as went through the passage was painted: and the painted part, he says, was not destroyed; but the paint was loosened on the wire, without being broken off, like the loose rind of a tree; which resembles the effect of the artificial electricity, in an experiment of Mr. KINNERSLEY's, where a wire was, by a great explosion, both lessened in diameter, and extended in length. The other part of the wire, which was not painted, except a short piece at the end, somewhat larger and of iron, was entirely melted. Query, If the wire before spoken of had passed through a stone, particularly a wet one, inclosing it firmly, would not that stone have been shivered to pieces?